

12. The crystal oscillator of claim 10 is which the injection signal is removed after oscillations have stabilized on the desired mode of oscillations.
13. The crystal oscillator of claim 10 in which the frequency reference for the frequency synthesizer is a VCXO, being fine tuned by the mode steering crystal oscillator in the recent past.
14. The crystal oscillator of claim 10 is which the VCXO is temperature compensated by using two or more modes of oscillation in the mode steered crystal oscillator.
15. The crystal oscillator of claim 10 in which the frequency synthesizer is fine tuned to the anticipated frequency of the desired mode to reduce the build up time of the desired mode.
16. The crystal oscillator of claim 10 is which initiation of oscillation is delayed until the oscillator has reached the operating temperature if a crystal oven is used.
17. A crystal oscillator comprising a gain element that is frequency selective due to saturation at one frequency; a crystal resonator capable of being excited on different modes; an auxiliary oscillator generating a frequency near the desired mode in the crystal resonator. A switching means to connect the injection signal to the mode controlled crystal oscillator until saturation has occurred and then removing it.
18. A crystal oscillator of claim 17 in which the frequency spectrum of the auxiliary oscillator is broadbanded by modulation using band limited noise or pseduonoise.

### **INJECTION MODE STEERING OSCILLATOR**

**ABSTRACT:** A means is provided to establish oscillations on a particular mode or resonance of a quartz crystal in a crystal oscillator and to discriminate against other modes. This is done by injecting a signal close in frequency to the desired mode until oscillation have been established and saturation of the active element has occurred. The limiting process then discriminates against the unwanted modes and holds the oscillation on the desired mode.